

NEUROBIOLOGY OF ADDICTION

Petros Levounis, MD, MA

Chair

Department of Psychiatry
Rutgers – New Jersey Medical School

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Outline

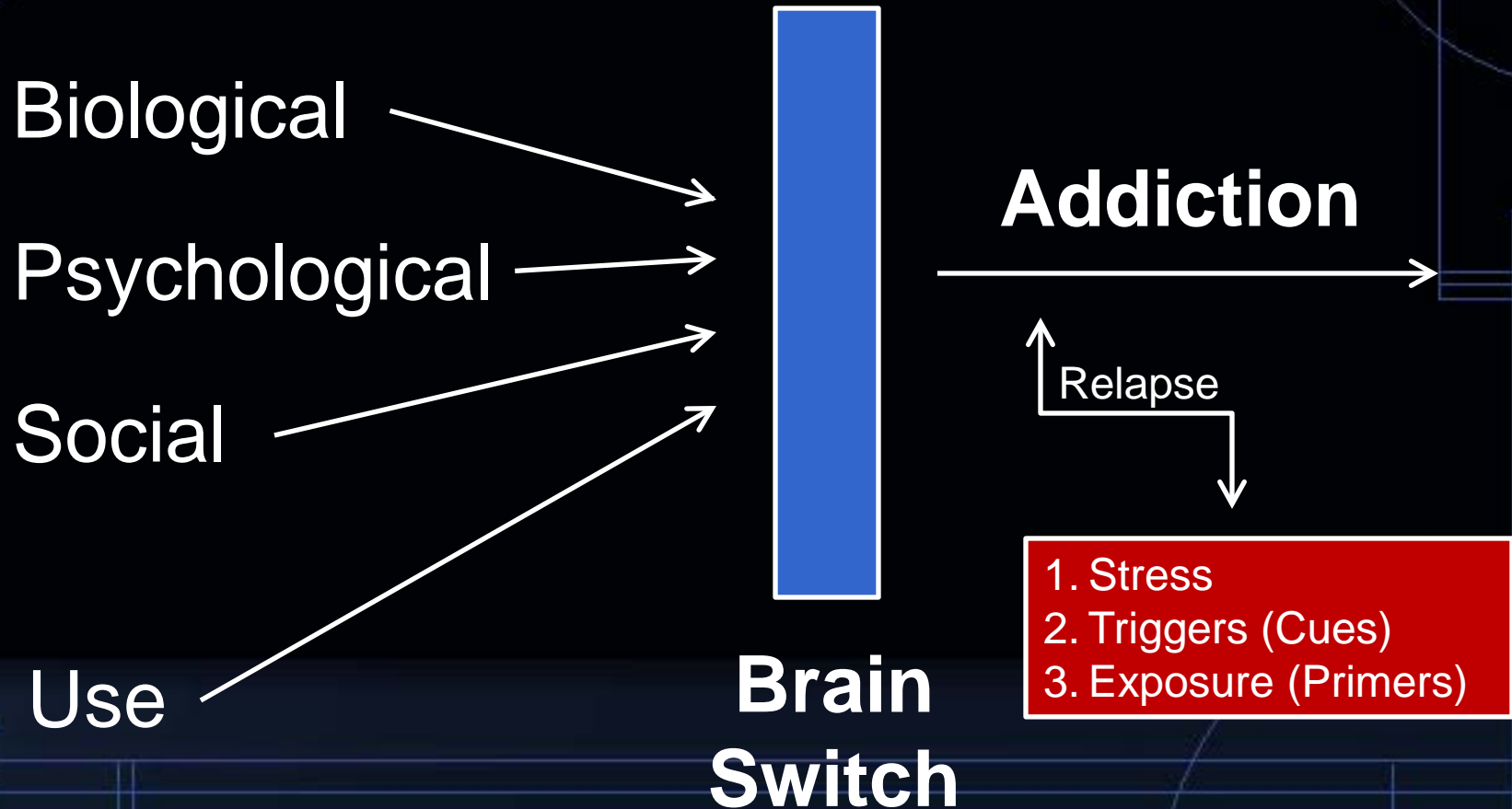
1. Neurobiology of Addiction
2. Psychotherapy of Addiction
3. Principles of MI
4. Practice of MI
5. Addiction Pharmacotherapy
6. Conclusions

1

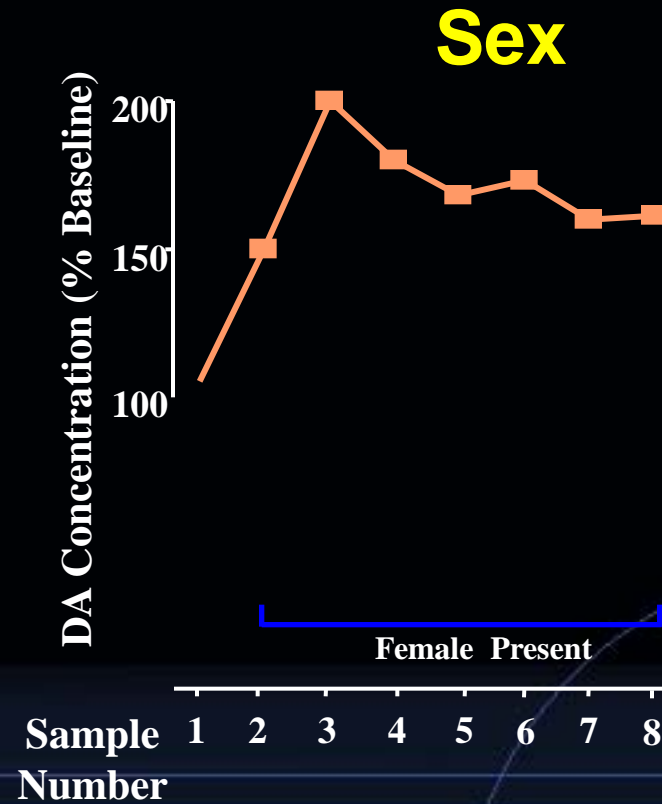
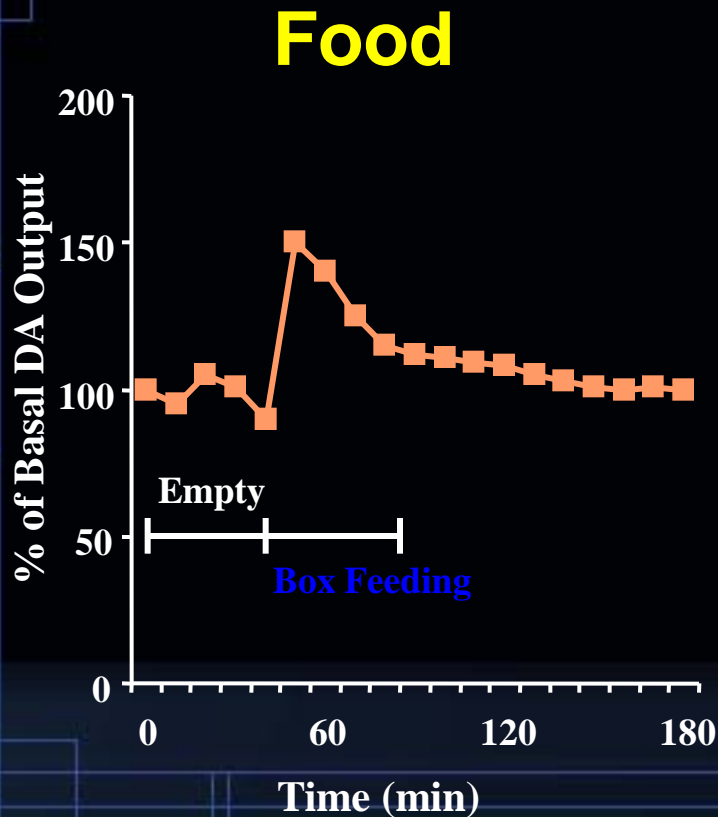
Neurobiology of Addiction

~ 2000

The Fundamental Model

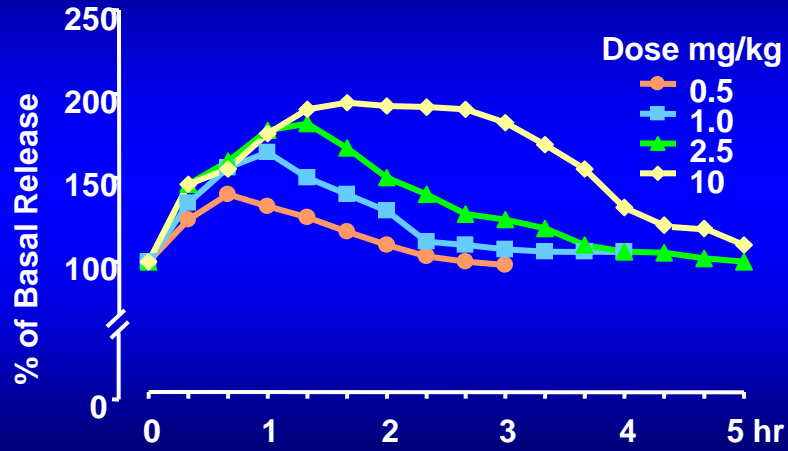


Natural Rewards and Dopamine Levels

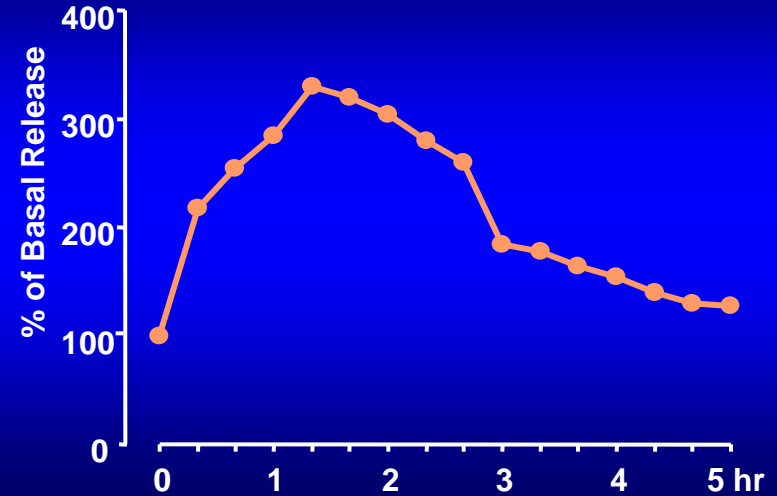


Effects of Drugs on Dopamine Levels

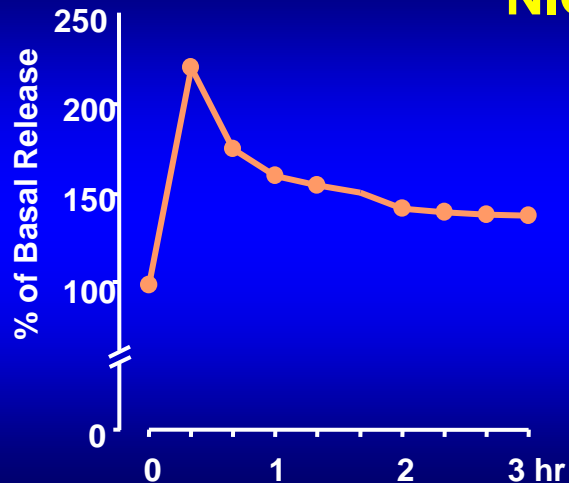
MORPHINE



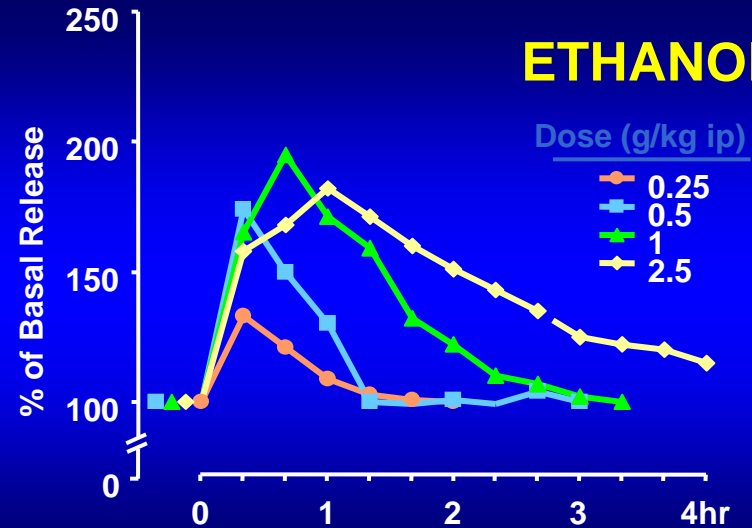
COCAINE



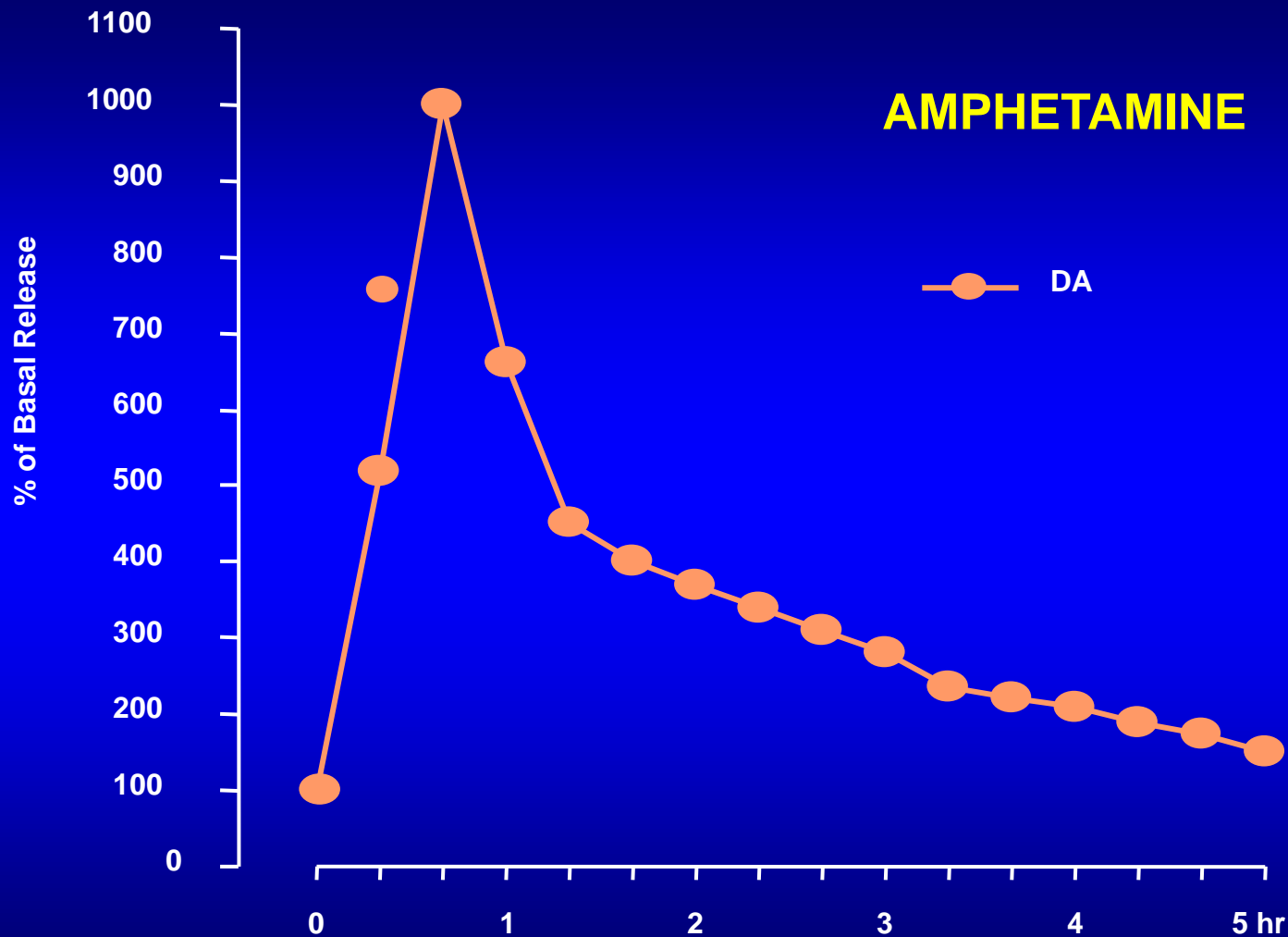
NICOTINE



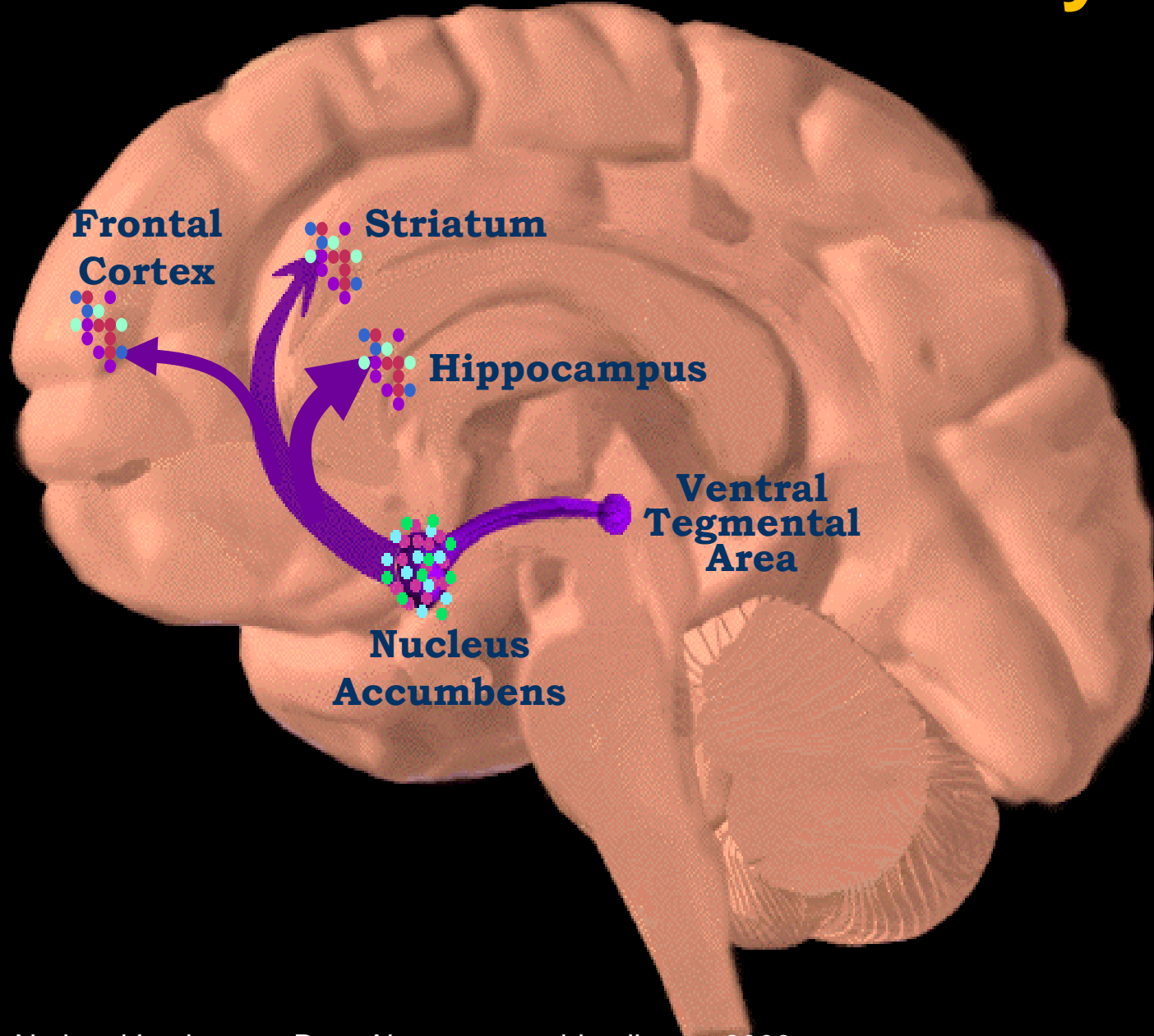
ETHANOL



Effects of Drugs on Dopamine Levels



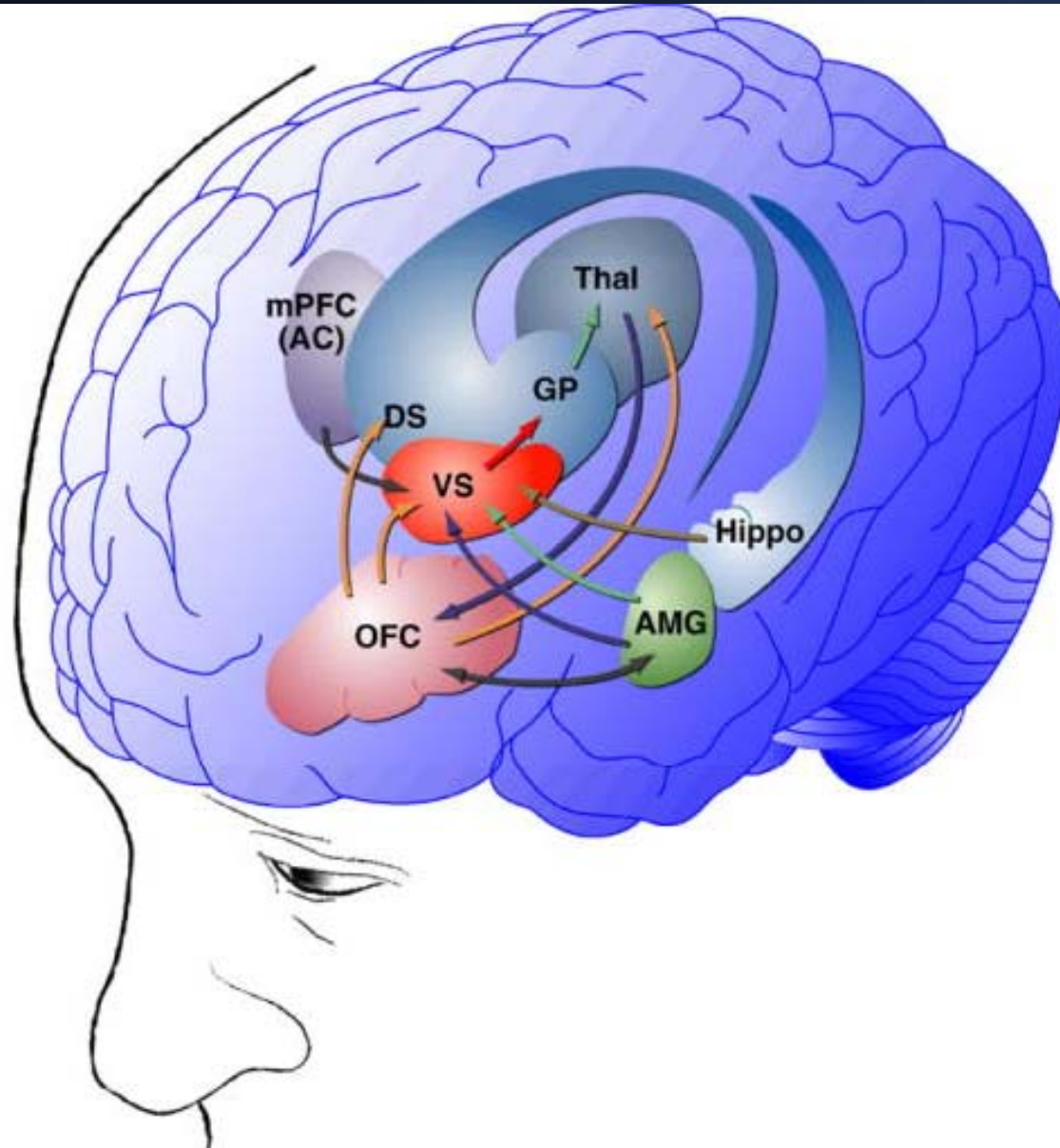
Pleasure-Reward Pathways



2013

Neural Circuitry of Addiction

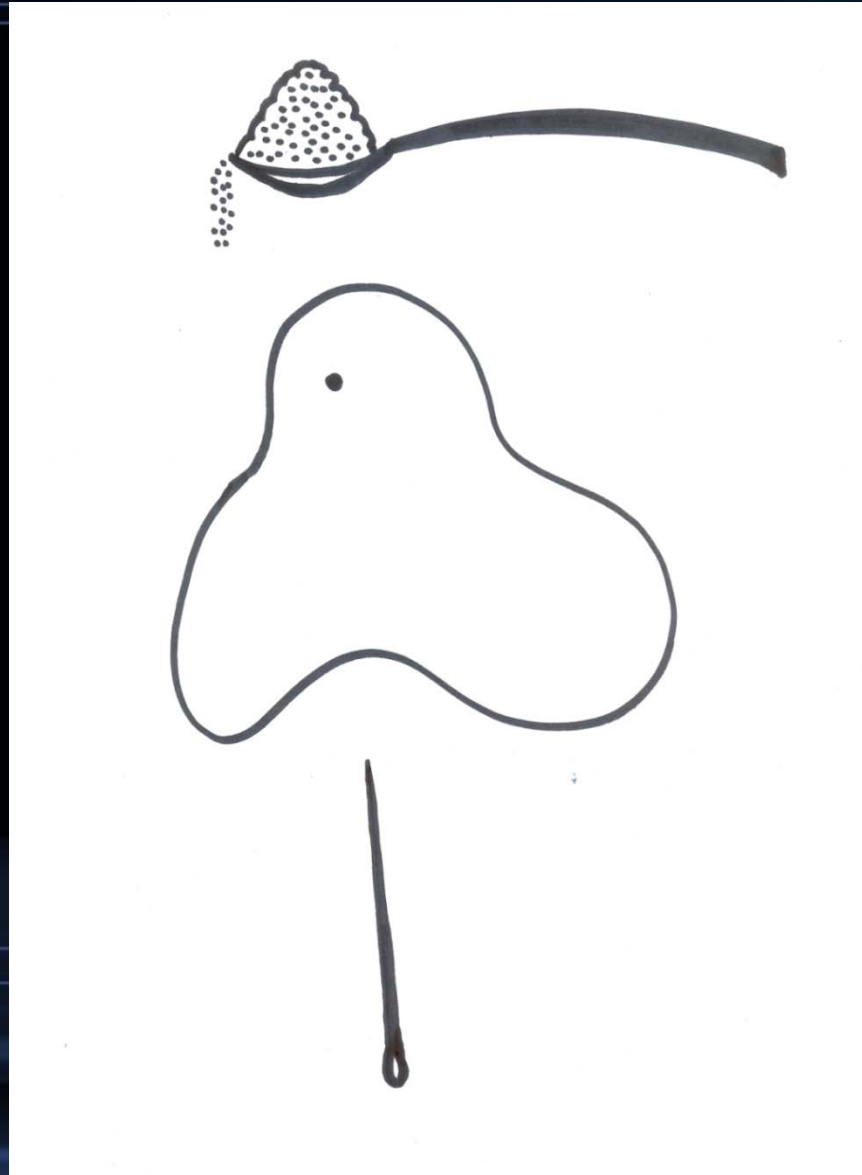
A



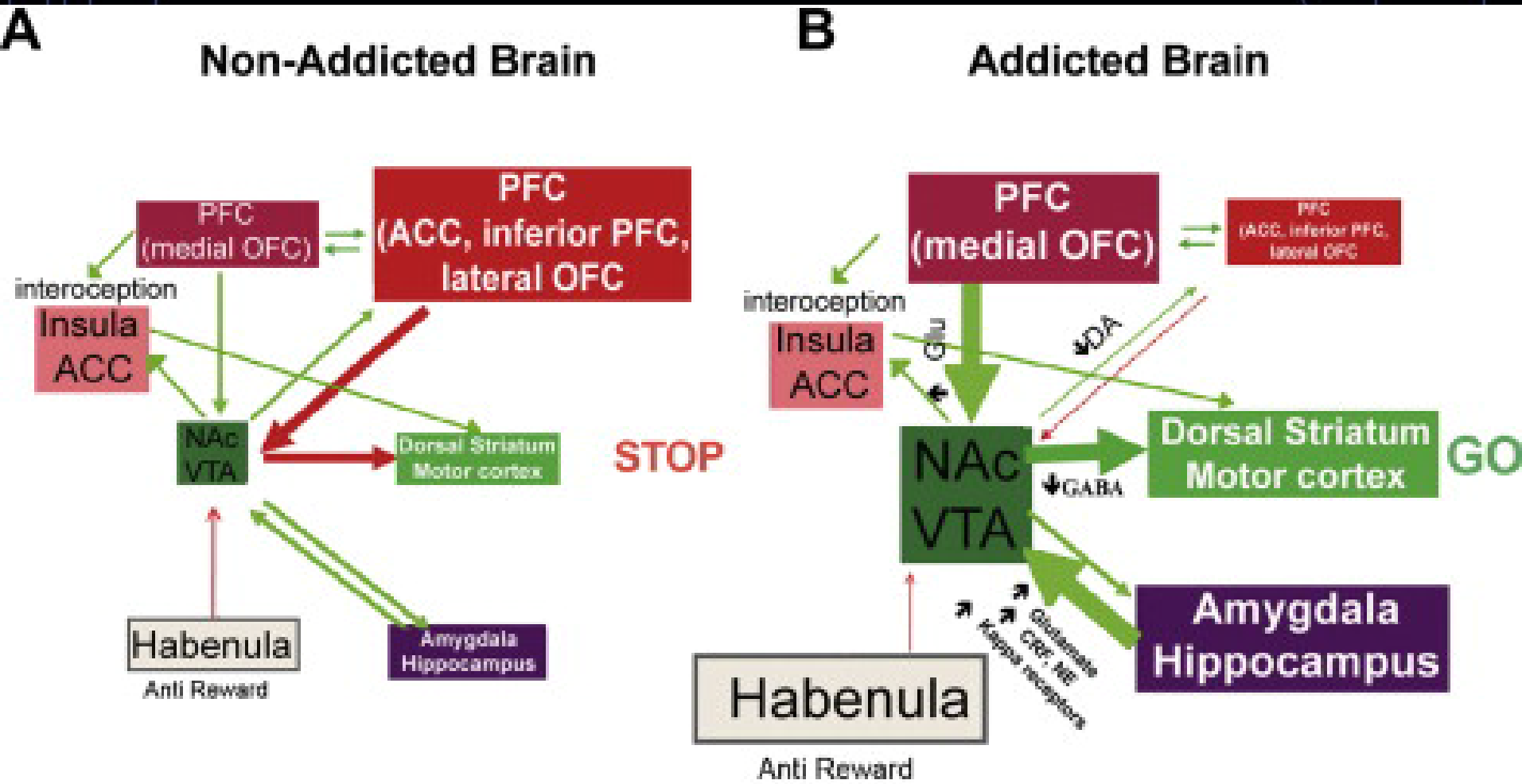
1. Addiction Neurotransmitters

1. Dopamine
2. Glutamate
3. γ -Aminobutyric Acid (GABA)
4. Serotonin
5. Norepinephrine
6. Corticotropin-Releasing Factor (CRF)
7. Opioids
8. Cannabinoids

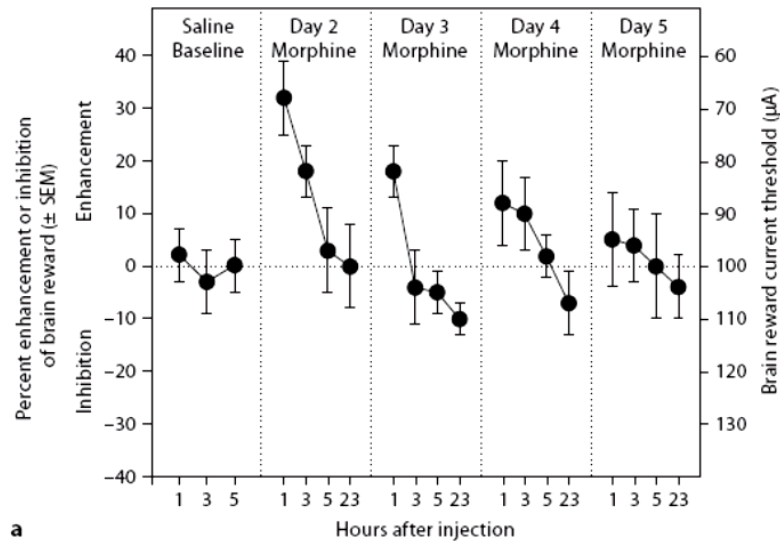
2. Motivation: More than an Amoeba



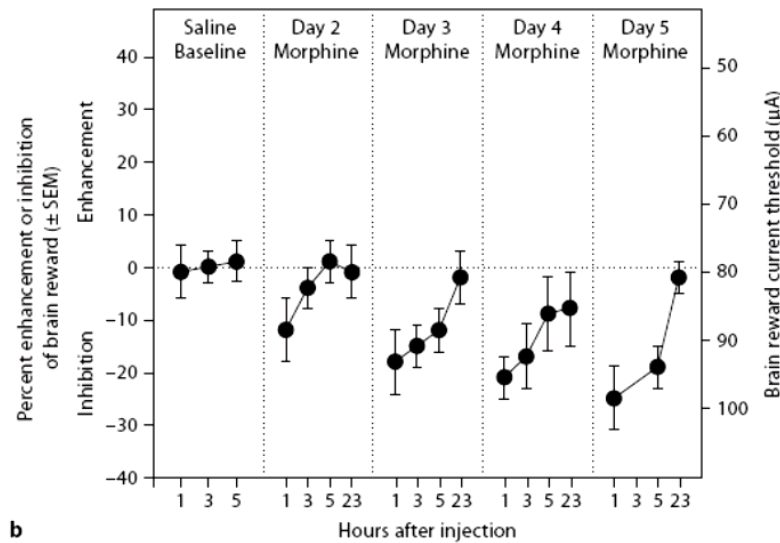
3. The Anti-Reward Pathways



Reward and Antireward Systems



a



b

Reward Systems



GAME 1

A. A sure gain of \$250.

84%

B. 25% chance to gain \$1,000,
75% chance to gain nothing.

16%

Antireward Systems



GAME 2

A. A sure loss of \$750.

13%

B. 25% chance to lose nothing,
75% chance to lose \$1,000.

87%

MATHEMATICS

GAME 1

25% +750

25% - 250

25% - 250

25% - 250

GAME 2

25% +750

25% - 250

25% - 250

25% - 250

HUMAN NATURE

- People avoid risks to ensure gains (even small gains).
- People take risks (even big risks) to avoid definite losses.
- Psychology trumps probability.

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A Brief History of the Psychotherapy of Addiction

1st Wave: Psychoanalysis

1. Psychoanalysis works for all treatable mental illness.
2. Psychoanalysis does not work for addiction.
3. Therefore, addiction cannot be treated.

2nd Wave: Boot Camps

The prototype, Synanon, was founded in California in 1958 to address heroin addiction.

The goal was to:

- break down defenses,
- bust through denial, and
- reshape the addict's personality.

2nd: Therapeutic Communities

1. Shaving heads
2. Hanging humiliating signs around residents' necks
3. Subjecting patients to “encounter groups” involving loud, free flowing attacks from staff and fellow residents

3rd Wave: Modified TCs

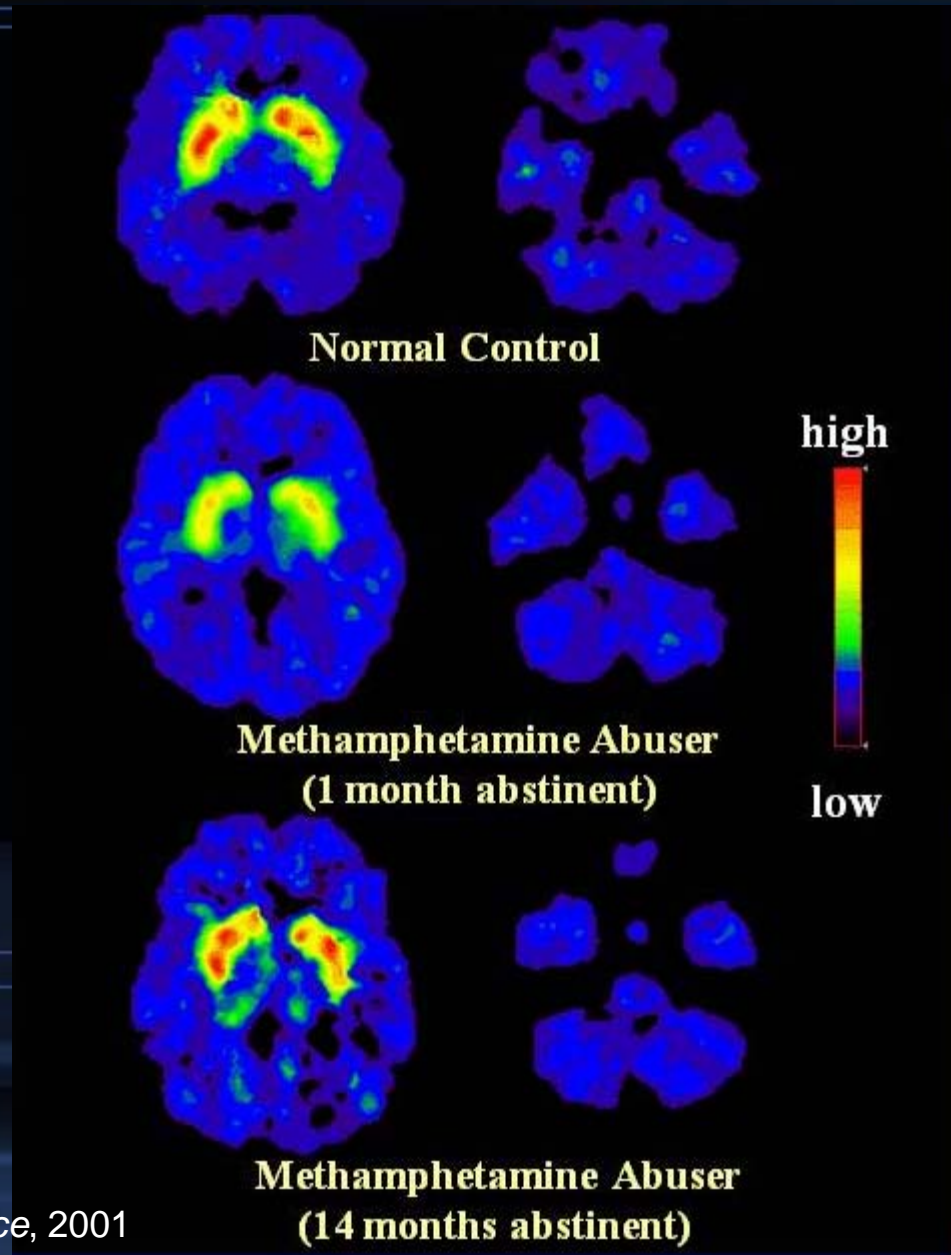
During the 1970s and 1980s, most Therapeutic Communities evolved beyond the Synanon model.

People started recognizing the limits and dangers of confrontive techniques.

3rd: Cognitive-Behavior Therapy

1. Based on Operant Conditioning
2. Functional Analysis
3. Skills Training to:
 - identify,
 - avoid, and
 - cope with thoughts & cravings

The Frying Pan Revisited



4th: The Kitchen Sink Approach

1. 12-step Facilitation
2. Relapse Prevention
3. Family Therapy
4. Primary Care
5. Mental Health Services
6. **Aftercare**

12-Step Facilitation

ALCOHOLICS ANONYMOUS

This is the Fourth Edition of
the Big Book, the Basic Text
for Alcoholics Anonymous



The AA Elevator Slogan

1. Spiritual Health
2. Professional and Vocational Health
3. Interpersonal and Family Health
4. Mental Health
5. Physical Health
6. Life

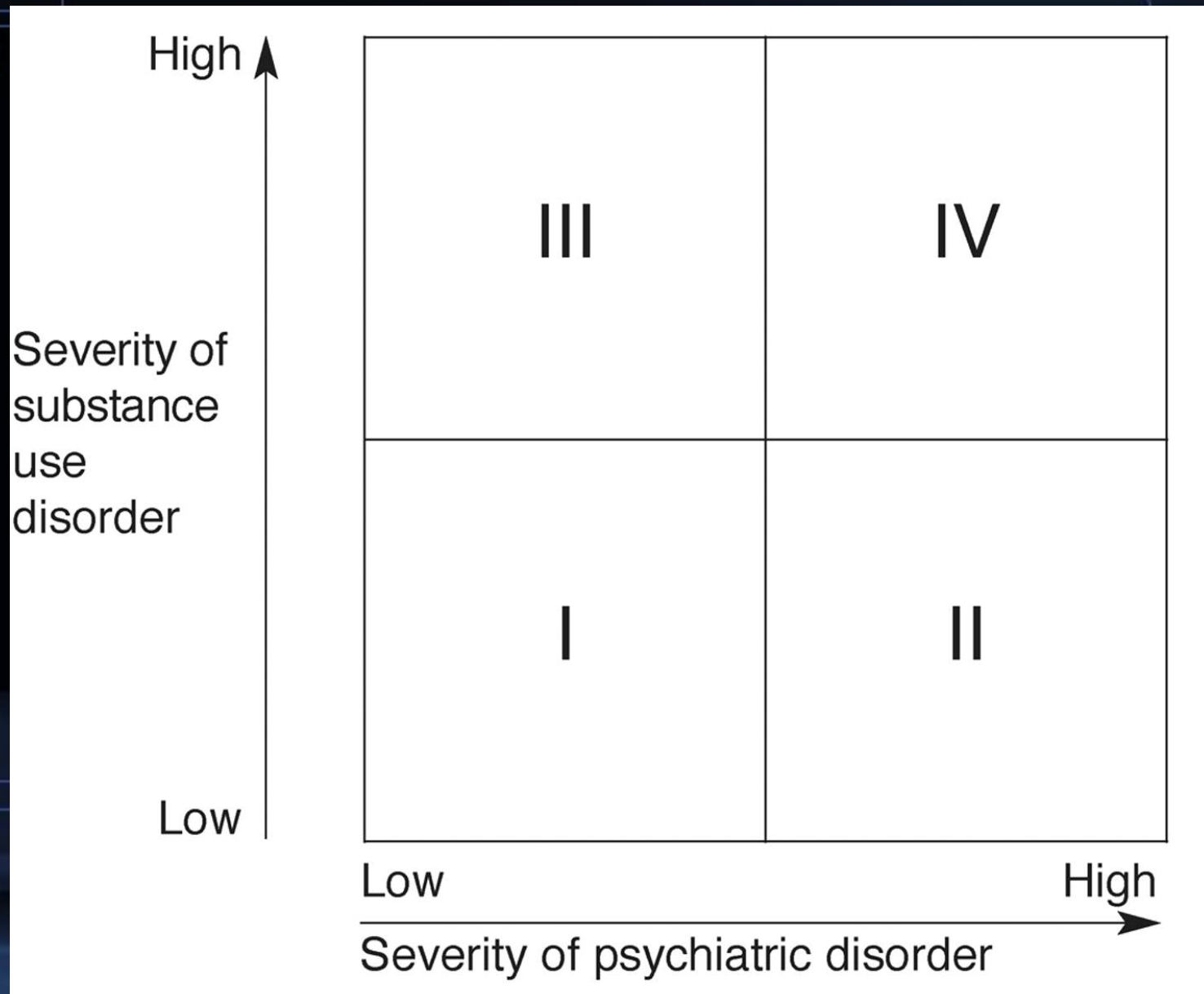
Medical Student Attitudes

STUDENTS	PERCEPTION	PATIENTS
1. Housing	1. Housing	1. Inner peace
2. Gov't Svcs	2. Outpatient Svcs	2. God
3. Medical Svcs	3. Medical Svcs	3. Medical Svcs
4. Outpatient Svcs	4. Job	4. AA
5. Job	5. Trusting People	5. Housing
6. Community	6. AA	6. Spirituality
7. Trusting People	7. Inner Peace	7. Outpatient Svcs
8. Inner peace	8. Community	8. Community
9. God	9. Gov't Svcs	9. Gov't Svcs
10. Spirituality	10. Spirituality	10. Trusting People
11. AA	11. God	11. Job

Psychiatric Co-Morbidities

1. **A third to two thirds** of addicted people also suffer from another mental illness—not 10%, not 90%.
2. **Treat both** the addiction and the co-occurring psychiatric disorder(s).
3. **Avoid benzodiazepines** and use antidepressants as first line treatments for anxiety disorders.

The Four-Quadrant Model



3

Principles of Motivational Interviewing

Motivation

1. “People are unmotivated” vs. “People are always motivated for something.”
2. “Why isn’t the person motivated?” vs. “For what is the person motivated?”

Ambivalence

1. Ambivalence is normal; needs to be explored, not confronted.
2. Ambivalence is a reasonable place to visit, but you wouldn't want to live there.

Principles

REDS

1. **R**oll with **R**esistance
2. **E**xpress **E**mpathy
3. **D**evelop **D**iscrepancy
4. **S**upport **S**elf-Efficacy

MI Today

Beyond REDS

Engaging

Focusing

Evoking

Planning

4

Practice of Motivational Interviewing

Phases

PHASE 1:

Building Motivation for Change

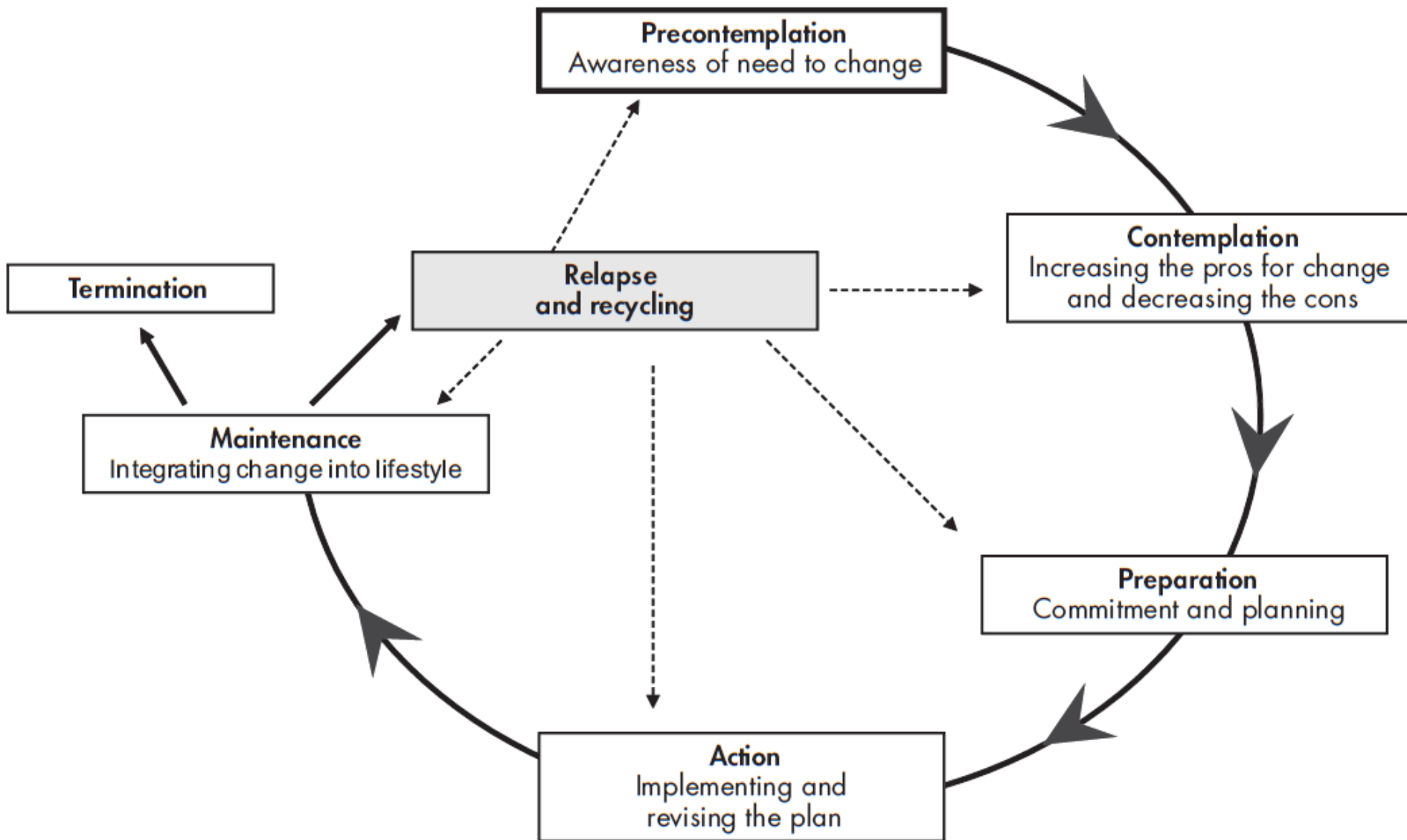
PHASE 2:

Strengthening Commitment to Change
and Developing a Plan.

The Stages of Change

1. Precontemplation
2. Contemplation
3. Preparation
4. Action
5. Maintenance
6. Relapse

The Stages of Change Cycle



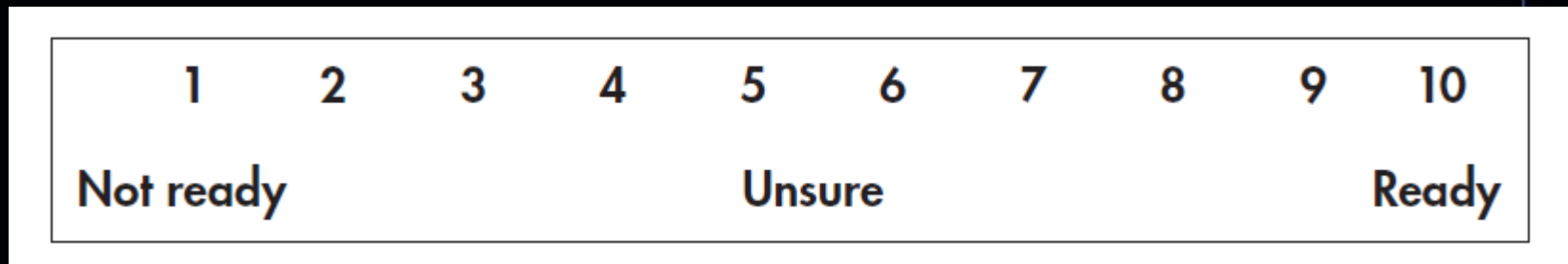
Working the Stages

1. Identify the Stage of Change.
2. Help the person move a little bit forward.
3. Don't rush her or him.

Precontemplation

1. Plant the seed of ambivalence.
2. Techniques:
 - ✓ Ask for a description of a typical day.
 - ✓ Hunt for the smallest discrepancy between where people are and where they would like to be.

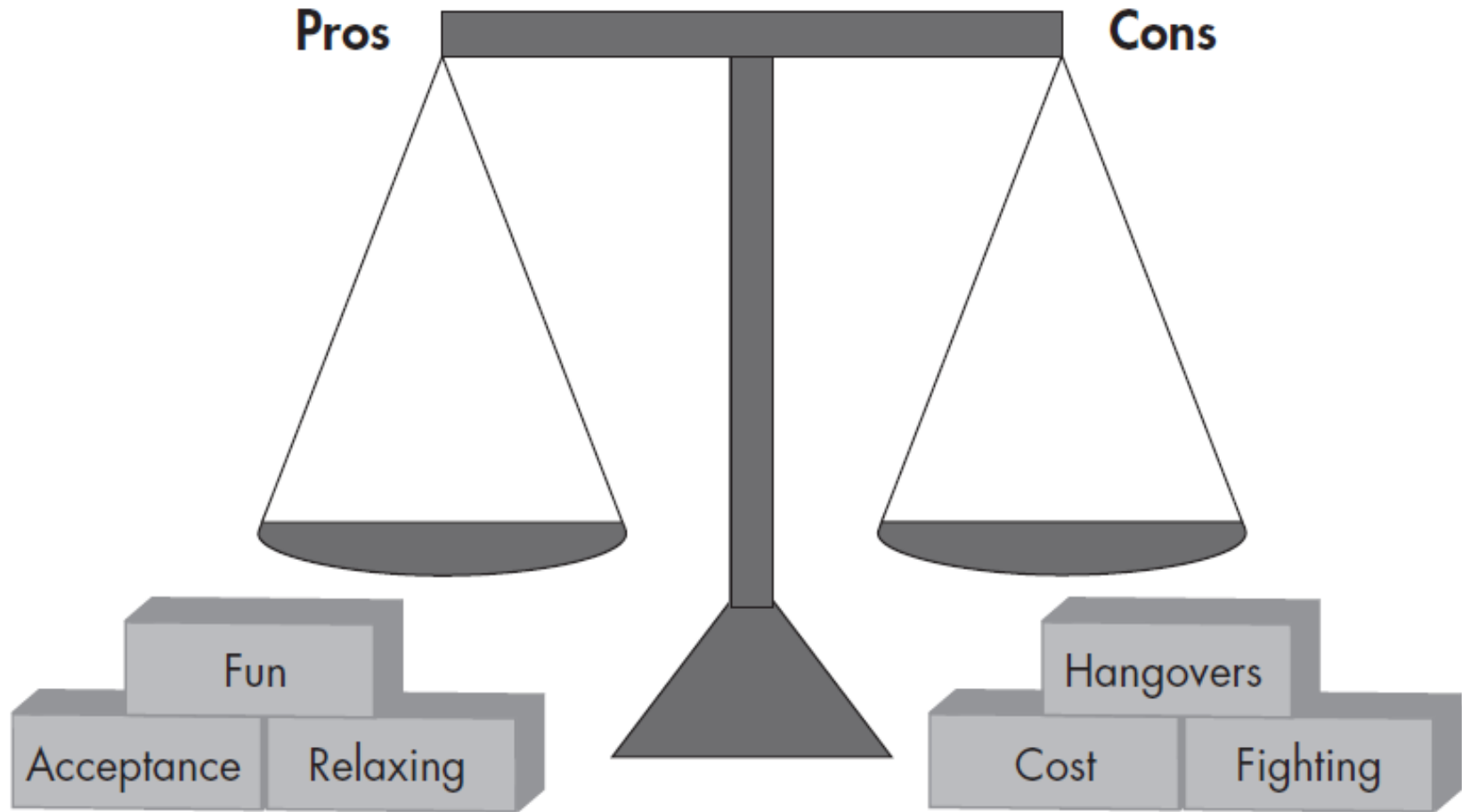
The Readiness Ruler



Contemplation

1. Open up to explosive decision analysis.
2. Techniques:
 - ✓ Brainstorm widely.
 - ✓ Explore both positive and negative prospects of life with and without the proposed changes.

The Decisional Balance



Preparation

1. Develop a realistic action plan.

2. Techniques:

- ✓ Anticipate problems and identify solutions.
- ✓ Unforeseen complications and frustrating obstacles may require revisiting “contemplation stage” techniques.

Action

1. Based on principles of learning, replace maladaptive patterns of behaving and thinking.
2. Techniques:
 - ✓ Essentially use a CBT model.
 - ✓ Provide ample positive feedback, encouragement, and support.

Maintenance

1. Back to the “kitchen sink” approach.
2. Techniques:
 - ✓ Recruit motivational, cognitive-behavioral, regulatory, disciplinary, and social approaches to sustain the desired change.
 - ✓ Explore disappointments, temptations, and doubts.

Relapse

1. Remember Confucius: “Our greatest glory is not in never falling but in rising every time we fall.”
2. Techniques:
 - ✓ Accept relapse as an opportunity to reengage, rethink, and reemerge stronger than before.
 - ✓ Reengage quickly, even if it is to the expense of deeper rethinking.

Technique: Reflective Listening

- Make a guess as to what the patient means. Skillful listening moves past what the person exactly said, without jumping too far.
- Like interpretations in dynamic therapy, if the patient becomes defensive, you know that you jumped too far, too fast.

Technique: Elicit Change Talk

- As a person argues on behalf of one position, she or he becomes more committed to it; we literally talk ourselves into (or out of) things.
- This may explain why the more “resistance” is evoked during a counseling session, the more likely it is that a person will continue to use.

Practical Suggestions

1. Listen > Ask > Give advice
2. Talk less than the patient.
3. Do not ask more than 3 consecutive questions.
4. Avoid wordiness.
5. Avoid interrupting.
6. Cooperate, do not force knowledge.
7. Relax.

5

An Even Briefer History of Addiction Pharmacotherapy

Two Main Strategies

1. Agonists

- Nicotine Replacement Therapies
- Methadone for Opioids

2. Antagonists

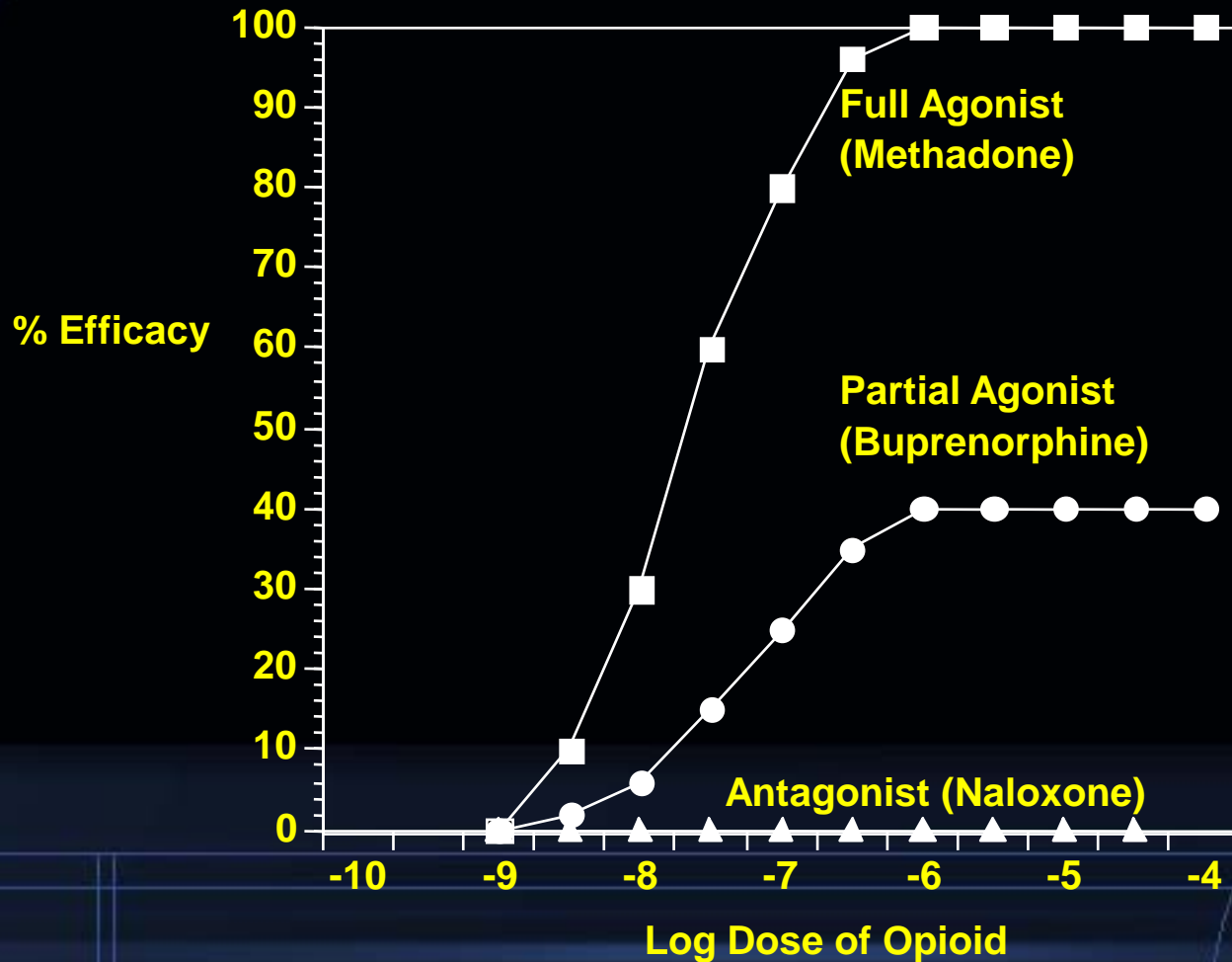
- Naltrexone for Opioids

The New Strategy

Partial Agonists

- Varenicline for Nicotine
- Buprenorphine for Opioids

The Ceiling Effect



6

Conclusions

1. Addiction hijacks both the pleasure/reward and anti-reward pathways of the brain.
2. Antireward pathways are likely responsible for the sustaining addiction.
3. Motivation has replaced confrontation as the primary focus of addiction treatment.
4. Motivational Interviewing is based on exploring and resolving ambivalence.

Thank you